VOLUME 35, NO.3 • THE GEORGE WASHINGTON UNIVERSITY • EDITION 1, FALL 1988

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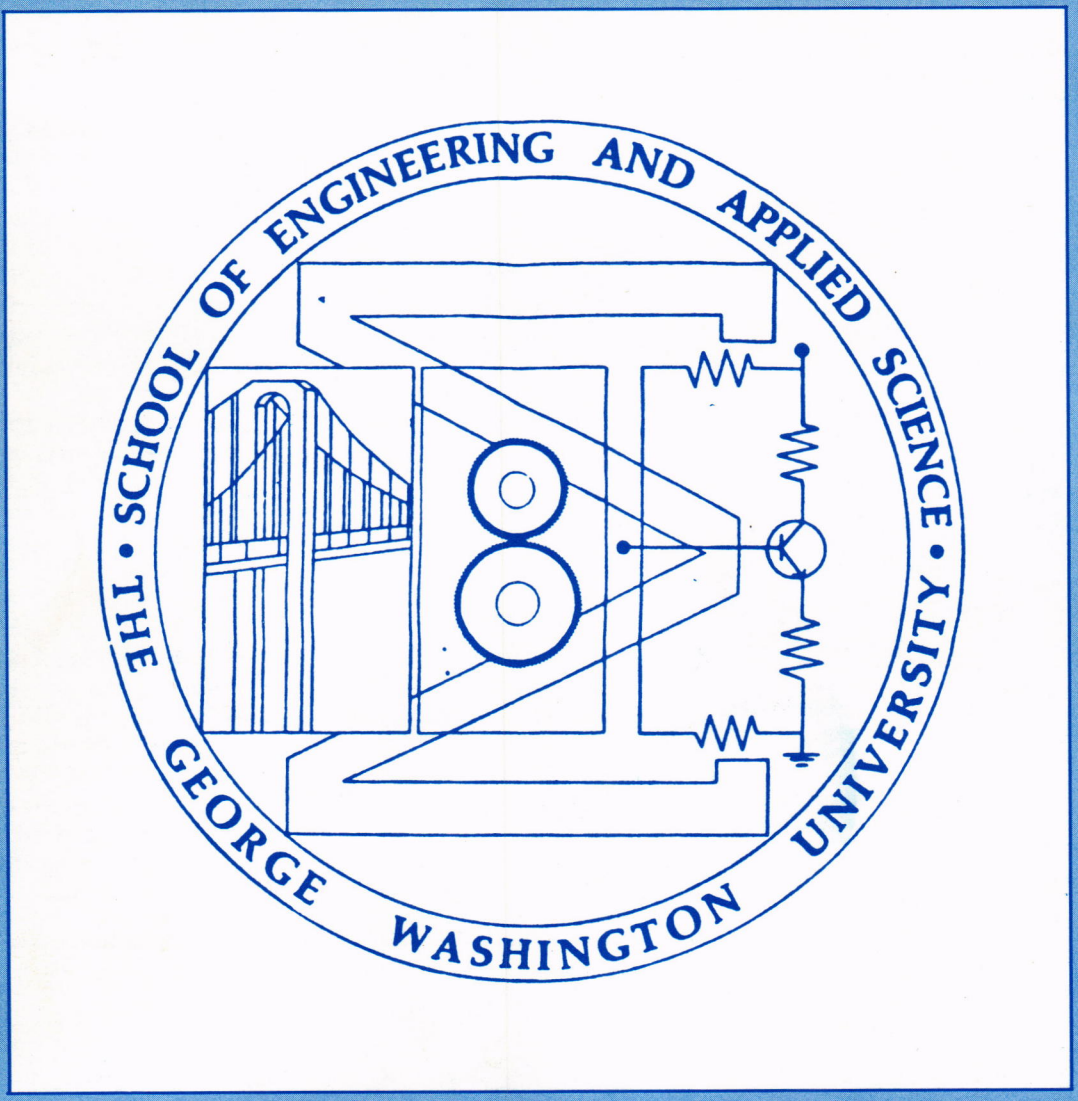

BY THE ENGINEERS' COUNCIL IN COOPERATION WITH THE ENGINEER ALUMNI

VOLUME 35, NO.3 • THE GEORGE WASHINGTON UNIVERSITY • EDITION 1, FALL 1988

MECHELECIV

Established 1942

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Greetings from the Engineer Council President
Tariq Alfadl

It is with great pleasure that I welcome all of the new and returning students of the School of Engineering and Applied Science, and wish the utmost success for all our future engineers in their quest for knowledge and learning in this institution.

As many of you already know, the Engineer's Council is the elected student governing body at the School of Engineering and Applied Science. The Council has the responsibility of acting as a liaison between SEAS students, faculty and administration as well as the student government of GWU in all matters concerning students interests. The Council has continuously worked for strengthening the relationship between students through various activities, such as the New Year Academic Celebration (NYAC), a field trip co-sponsored with the Engineer's Alumni Association (EAA), the Engineer's Olympics, and the Engineer's Ball. Also, the Council publishes this quarterly magazine in cooperation with the EAA as a valuable source of knowledge for engineers and alumni alike. Our role also extends to bringing to the attention of faculty and administration all the concerns and remarks brought up by the students, concerning their own welfare and the school at large.

We, the student representation, urge you to participate in all the Council's activities. We also encourage you to voice and bring up your concerns and suggestions to your student representatives, so that they can be communicated to faculty members and administration. Moreover, if you need free photocopying, typing, word processing, or just a quiet place to study, please stop by the Davis-Hodgkins House at 2142 G Street. Finally, I would like to bring to your attention that this magazine is produced by a number of dedicated students like you and me, so if you have any material that you would like to publish in the MECHELECIV magazine, please bring it to the attention of our co-editors. This message also goes out to all the faculty and alumni. Remember, this Council is by the students and for the students.

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COVER:
The Engineers Council are going to dress up G.W. engineers with style! Good quality white sweatshirts, adorned with the emblem seen on the cover of this issue, should be coming out in November. They will be sold at a very reasonable price. So buy a G.W. SEAS sweastshirt, and be proud to be a G.W. Engineer!!

GREETINGS FROM ENGINEER ALUMNI ASSOCIATION PRESIDENT NAHID KHOZEIMEH

This Fall brings news of exciting changes on campus: a new President, additions to a strong faculty, acquisitions to enhance research capabilities, and a new class of entering students. To you especially, the Engineers Alumni Association extends special greetings as you begin your studies at the School of Engineering and Applied Science.

I recently have written from this column to reflect upon EAA's Silver Anniversary, and to encourage our members to work towards strengthening our alumni organization. I would like to use this opportunity to concentrate on ways in which each of us can promote the objectives of the School of Engineering and Applied Science.

From the vantage point of professionals trained in the engineering and applied sciences, we alumni are keenly aware of the importance of quality scientific education — not only as the foundation upon which we have built our own individual careers, but as the basis for all future accomplishments in the fields we represent. Making available the best possible academic and research opportunities for the training of tomorrow's engineers and applied scientists is at the heart of EAA's mission. We express this commitment to quality scientific education most visibly through our ongoing support of the programs and activities of the School.

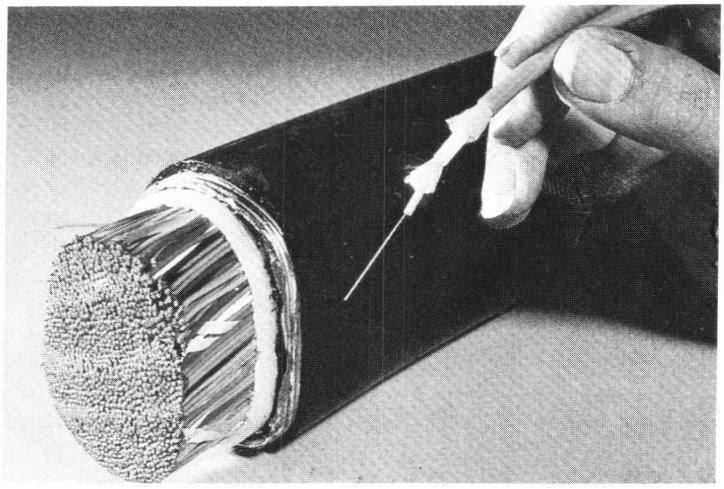
However, our stake in the future and our commitment to the institution that gave us each our start, challenge us to greater activism in our support for the School's mission. In addition to our financial support and our sponsored activities throughout the year, opportunities exist for us to individually advance our shared interests in the School in imaginative and meaningful ways:

- As representatives of GWU in our communities, recommending the School to prospective candidates for admission allows us each to promote the enrollment of top students.

- As career professionals, we can take part by returning to campus to speak to students, by supporting private sector assistance to higher education, and by encouraging corporate participation in the School's Cooperative Education Program.

- As alumni concerned for the advancement of the engineering and applied sciences, we can assist in the placement effort by helping SEAS graduates find challenging and rewarding opportunities in careers that will make a difference.

I ask you to help us to creatively explore new ways by which we can contribute the benefit of our experience to building an even greater SEAS, and a promising future for its graduates.



Many single fibers are surrounded by a glass cable which is used to prevent light from escaping the core of individual fibers.

Fiber Optics- An Advantage over Coaxial-based LAN's

In the technology of fiber optics, researchers transmit attenuated light for required distances through manufactured glass fibers. These fibers, having a diameter slightly larger than the human hair, are composed of a glass core surrounded by a glass clad. The light signals are passed through the core and will not escape, for the clad acts as a wall. Many times, these single fibers are bound together to form a cable, and the light passed through these cables originates from a laser or from light emitting diodes (LEDs).

When fiber optics are used in local area networks (LAN), they may be compared to the current traditional digital representations of data. Fiber optics can perform the same function using light instead of electricity, where a tranceiver at one end of a fiber contains an LED. The tranceiver converts electrical pulses to light pulses as seen at the LED. These light pulses are then sent through fibers where they meet another tranceiver which converts the light signals back to electrical signals. The equipment attached to the tranceiver may then use these signals. Fiber optics offers advantages over the coaxial cable method in the following areas: bandwidth, low signal loss, electromagnetic immunity, small size, safety, and cost.

The maximum bandwidth of a coaxial cable is ten megabits per second (Mbps), while fiber-optic cables have established a maximum bandwidth of over 150 Mbps. The results are such, because fiber-optic cables transmit light instead of electricity, thus, the physical properties of copper wiring need not be considered. What this means is that the degradation in quality that occurs as data transfer rates increase need not be of concern.

Since optical fibers produce a low attenuation of signals, long cable runs may be set up utilizing fewer repeaters. As an example, a coaxial-based system requiring repeaters every 1.1 kilometers is equivalent to a system using the low-signal-loss fiber optics, which would space repeaters every 11 kilometers.

Electromagnetic fields do not affect fiber optic cables and consequently, crosstalk, echoing, and ringing will not occur. Unlike the coaxial cables, the fiber optic cable neither attracts nor emits this electromagnetic energy. Therefore, fiber-optic cables are ideal for such areas like factories, computer rooms, and areas with mechanical or electrical equipment - all of which encounter electromagnetic interference. Also, fiber optic cables are almost impossible to physically tap without detection. Here, the non-existence of electromagnetic energy provides security by eliminating possible eavesdropping.

Since the fibers are very much smaller that a coaxial cable, less space is needed at installation. This leads to advantages of placing the fiber-optic cables under carpets in some cases versus the method of running special conduits under the flooring for coaxial cables. Another aspect to consider is that glass is lighter than copper, so that installation is again easier for fiber-optic cables than for coaxial cables (which sometimes require special pendant- or surface-mounted fixtures).

The safety of fiber optics makes it a suitable choice for installation in environments that contain explosives like chemical plants and refineries. This can be seen from the fact that fiber optics do not carry electricity and therefore cannot produce any sparking hazards.

Fiber optics is presently a commodity, and thus maintains a price that is competitive. Even though coaxial cable has cost benefits from being part of the existing technology, the currently growing acceptance of the fiber-optic industry has lowered the price gap. Other factors which have contributed to the drop in the cost of fiber optics include

improved manufacturing processes, higher volume, and inexpensive materials (which combine stainless and ceramic connectors versus all stainless construction). In addition, as more commercial fiber-optic vendors begin to flood the market, the cost will decrease. With fiber-optics quickly replacing existing coaxial cables, who knows how small and efficient our future devices will be.

-Martin Loui

The Japanese Supercomputer Threat

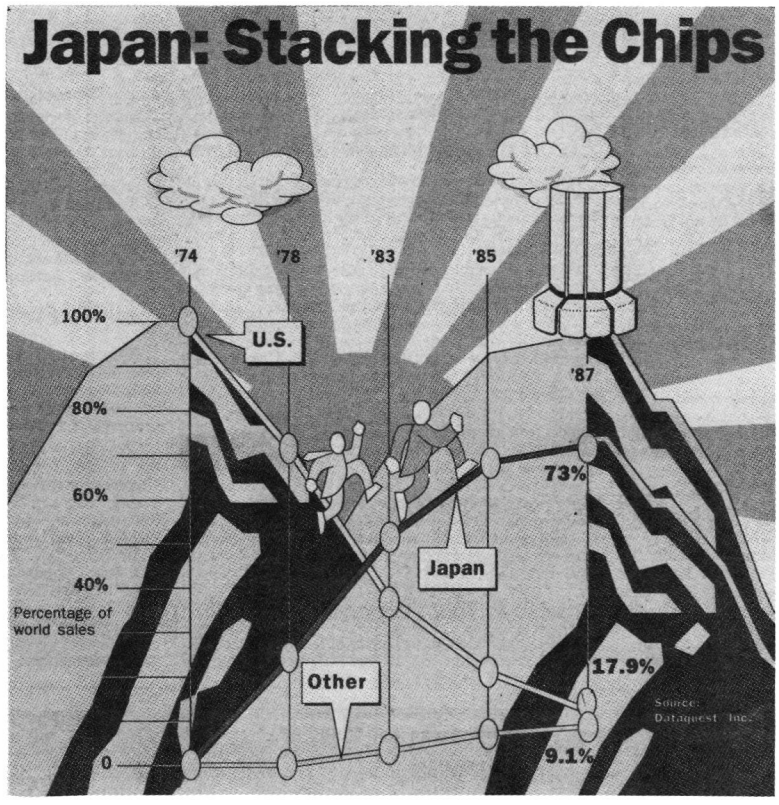
A study released this August by the Institute for Electrical and Electronics Engineers (IEEE) concludes that the U.S. leadership in the supercomputer industry is now vulnerable to Japanese developmental efforts. Supercomputers are used to perform complex numerical simulations which require enormous computing power. They also play a vital role in research done at government and military laboratories.

The Japanese companies - Nippon Electric Corp., Fujitsu Ltd., and Hitatchi Ltd. - are at the forefront of Japan's supercomputer efforts and are the leading producers of advanced storage devices called dynamic random access memory (DRAM) chips. Alan McAdams, a member of the IEEE supercomputer panel and a economics professor at Cornell University, states, "half the price of a Cray [supercomputer] is memory and the memory comes from Japan. If you are going to be a technology leader, you have got to have produce your circuitry, you must reveal to your competition what your circuitry is."

The chief U.S. response to the Japanese challenge is a government-industry semiconductor manufacturing consortium called Sematech. However at this point, Sematech is understaffed, unorganized, and behind schedule. Many critics feel Sematech should shift its focus from manufacturing research and development to production of DRAM chips which could be used to compete with Japan. However, Sematech's chief executive, Robert Noyce, argues, "The idea is to get more advanced [chip manufacturing] tools into the hands of U.S. manufacturers."

The IEEE study concludes that by taking over the DRAM market and becoming prominent in supercomputers field, Japan will eventually dominate the world data processing and communications markets. At this point however, the U.S. supercomputer industry remains sound with the best designers and the biggest market. Furthermore, IBM Corp. reentrance into the market should bolster the American industry's standing. The study concludes that the future of the industry depends largely upon the tense state of U.S./Japanese trade relations.

-Nelson Kee



The Japanese takeover of the DRAM market. Courtesy of Defense News.

Expert Systems: To Be or Not to Be

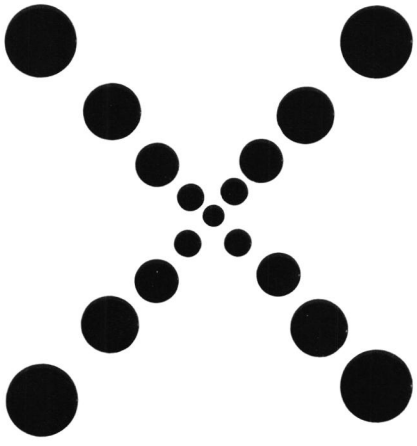
"Artificial intelligence has the same relation to intelligence as artificial flowers have to flowers"
-David Lorge Parnas.

It's curtain time, the show is about to begin! The main "characters" in this "drama" are commercial expert system shells. These systems are heavily marketable for Artificial intelligence applications when fully implemented. The purpose of this paper is to discuss these "characters" in our "drama", and consider whether it will be a comedy play, a tragedy, or a true story.

To set the scene, one should first understand the meaning of Artificial Intelligence. Artificial intelligence as defined in **The Fifth Generation**, a book written by Feigenbaum and McCorduck in a subfield of computer science, is concerned with pursuing the possibility that a computer can be made to behave in ways that humans recognize as "intelligent" in each other. Although this view of AI is widely accepted, we should include the fact that artificial intelligence research and development of technologies is not an exclusive field of computer science but a broad area of interest for fields as different as psychology and engineering sciences. There are well-known commercial systems that are good examples of what can be done to make computers "behave in ways that humans recognize as intelligent behavior in each other".

But what are expert systems and commercial expert system shells, and how are they related to AI?

Expert systems are computer programs that contain knowledge about objects, events,



situations, and courses of action which emulates the reasoning process of human experts in a particular domain. A well documented, carefully developed and fully tested expert system can achieve highly reliable performance based on predictions and conclusions concerning a particular subject for which they were designed. MYCIN, an expert system used as a diagnostic reference tool, is a good example of what an expert system can do.

Expert systems receive their names from their unique techniques to acquire, represent and manage their data base of "knowledge". Commercial expert system shells provide means to capture knowledge obtained from experts in a specific area. This means is in the form of rules (if-then), semantic networks, frames, scripts, goals and subgoals. At run-time, after the knowledge has been captured the shells become expert systems. These expert systems can provide explanation features like "how" or "why" a decision has been reached, graphics displays and sometimes interactive participation in the decision making process.

Expert system shells are a level up in the hierarchy of high level languages without being a "real" language. The program development with these shells is through English like rules, or through interfaces using semantic networks or logic trees. This feature allows versatility that is unique, and is responsible for their commercial success and position in the AI world.

Nonetheless we should not consider expert systems as a synonym for artificial intelligence but as a subfield of the AI world, with the potential of standing by itself in the world of computer technology, and thus taking a step forward towards the goal of "making computers behave in ways that humans recognize a intelligent behavior". Artificial Intelligence will remain an open area for research for many years to come with its efforts in making computers more intelligent and independent. Expert systems capable of learning by experience, and having natural language interfaces, are highlights of what we can expect from the research being carried on at the present time.

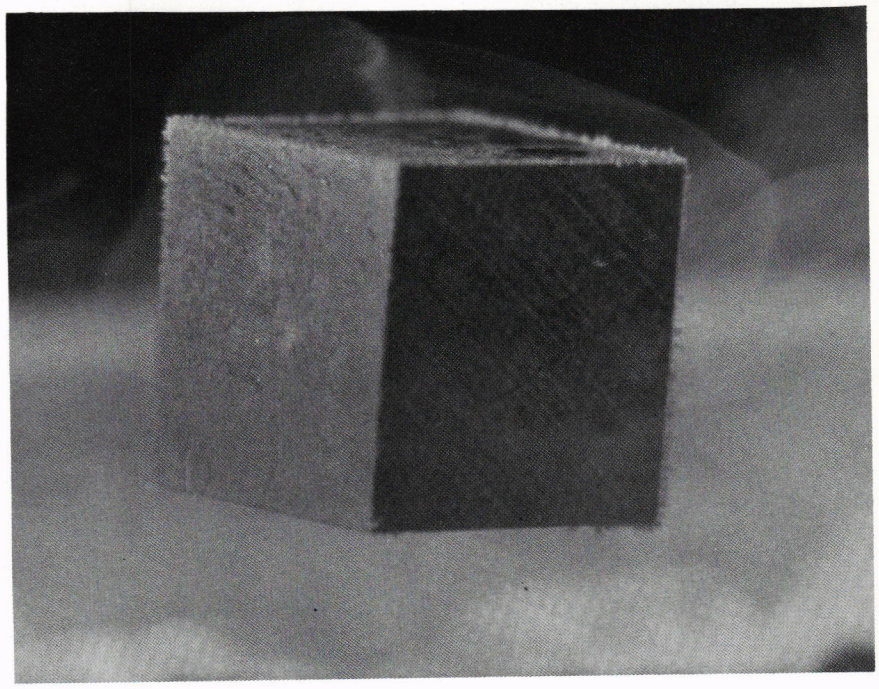
Expert Systems, to be or not to be, is a good but inconclusive true story that with more years of intensive research promises to have a spectacular ending.

-Anaed Zaragoza

Temperatures Rise As Superconductivity Research Continues...

New insights inquired from physicists and chemists have opened the door and shed new light and hope for research in the world of superconductors. Until recently superconductor research was down played, and many felt, we will never see superconductors put to practical use. That view has changed now, as physicists and scientists predict the potential benefits will be enormous in the future. Superconductivity is the ability of certain materials to conduct electricity with zero resistance, therefore, preventing the generation of heat and the loss of energy.

Superconductors work in such a way that materials are made superconductive by cooling them in liquid helium to an extreme temperature of 23 degrees kelvin (-412 degrees Fahrenheit). When these materials are cooled to that extreme of a temperature, the material creates a powerful magnetic field, in which electrical current can pass through with no energy given off. The problem with superconductors is that the liquid helium used in cooling is too expensive and unstable. Applications of superconductors was put on hold until physicists could find a material that would remain resistance-free at warmer temperatures.



Intense Magnetic fields generated by the Superconducting Ceramic pellet helped to deviate is over a magnet.

Just recently Dr. Ching-Wu Chu from the University of Houston discovered that an oxide called yttrium became superconductive at 94 degrees kelvin (-293 degrees Fahrenheit), a temperature low enough to use liquid nitrogen as the coolant. This also is inexpensive and found in abundance. The discovery by Dr. Ching-Wu is the highest temperature on record in which superconductivity has taken place. By his discovery, scientists suddenly became exuberant, and now the race is on to discover even better oxides and higher temperatures of superconductivity.

With all this talk, new hope, and all the money being allotted for superconductive research, you may start to wonder... Will superconductors some day find practical applications in society? If indeed physicists come up with material that can become superconductive at room temperature, thus eliminating the need for any cooling, you will see superconductors make an impact on society.

One interesting property of superconductors is their ability to generate a magnetic field intense enough to cause levitation. As a result of this property, Japan is already testing an experimental train that can travel friction-free above the tracks at 300 plus miles per hour. Some other applications include; pollution-free power which could be created without radioactive wastes, smaller and faster computers could be produced, and electric motors that use fuel supplies produced by superconductors. Physicists and scientists are dreaming of the possibilities as they work around the clock to solve their biggest problem of all, raising the temperature.

-Jeff Dion

Starting Your Professional Career with the Co-op Program

This month you are studying for exams and doing homework problems. Next month you might be designing part of a data processing system at NASA, or working with flight simulations at MITRE. That is, you will if you become a part of G.W.'s co-op program! At George Washington University there are currently 75 students participating in the program under Howard Davis, our co-op coordinator.

A great advantage of the Washington D.C. area is the large number of engineering job opportunities. Just a few of the companies participating in the program are NRL, Army Concept Analysis Agency, National Highway Traffic Safety Administration, IBM, NSWC, MITRE, Central Main Power, Xerox, RCA, and NASA. More companies are becoming aware of the advantages of the program every day.

Howard Davis has ideas to expand the co-op program, to include career services, such as writing resumes and interview help. Davis and Professor Fox are working to expand the program to benefit more students, and increase the quality of education they receive.

The Cooperative education experience allows a student to integrate full time work experience with college level academic study. The co-op student spends some of his undergraduate summers and two full semesters after the sophomore year working in government or industry as a paid engineering assistant. The interaction of study and work experience enhances the student's academic knowledge, personal development, and professional preparation.

To get application forms and additional information go see Mr. Howard Davis, Cooperative Education Coordinator, Tompkins Hall Rm 103 (202-994-6158).

Or Write:

Mr. Howard Davis
Coordinator
Cooperative Education Program
SEAS
George Washington University
Washington, D.C. 20052

My Co-op Experience

by Lisa LaGrand

I am a senior majoring in Computer Engineering, and I have been a participant in the Cooperative Education Program, since my second semester sophomore year. I am a co-op student working at the Naval Research Laboratory (NRL) in S.W. Washington, D.C. Even though the co-op program adds an extra year to my goal of obtaining a B.S. in Engineering, it also gives me invaluable experience.

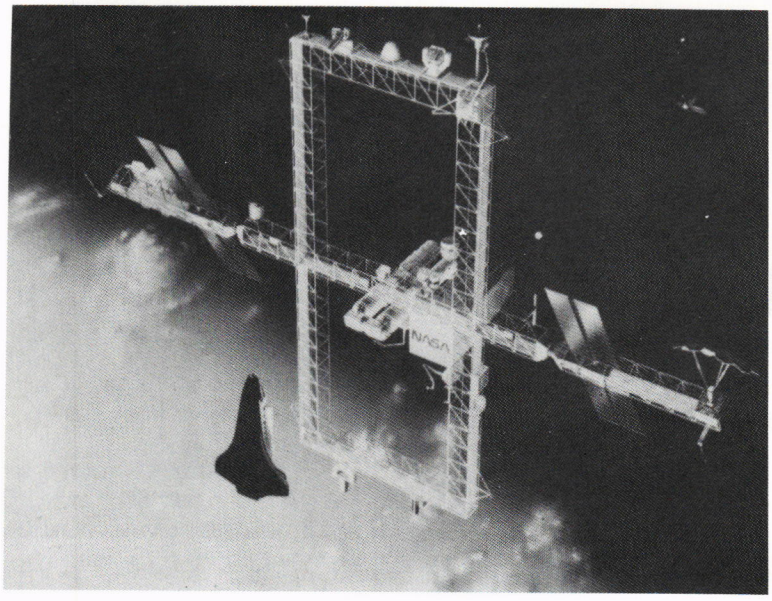
At the Naval Research Laboratory, I work in the Plasma Physics Division under the supervision of Dr. Arne Fliklet. My main objective is to run and maintain certain Fortran codes that produce graphical output that the physicists analyze and use in the designing and alterations of their experiments. I also draw to scale, experimental apparatus on the Computer-aided Design (CAD) system. During my stay at NRL, I have been introduced to many software packages and computer systems. My job experience also helps me to understand some of the theory I am taught in the computer science courses at school.

In addition to the job experience I have acquired at NRL, other important benefits were also exposed to me. NRL has a terrific technical library on base. This comes in handy when I need additional references for my courses. One benefit, however, surpasses all... and that is the CO-OP tuition program. My full tuition is paid for, as well as a fraction of my books. An obligation of working at NRL lies ahead for me after graduation for only a short while, but this I figure is a small price to pay for all that I am gaining. I would encourage every engineering student to join the CO-OP Program at GWU. It may take you a little longer to graduate, but the time invested will be well worth it. Remember, it just does not take a degree to get a job nowadays, especially in the high technical fields. You need good job experience, and the CO-OP program is a great way to earn it.

Lisa LaGrand is a senior in Electrical Engineering. She co-ops at the Naval Research Lab in the Plasma Physics division. She is a member of IEEE and Eta Kappa Nu. Her future plans include graduate school.

NASA : "We're Looking for Very Few Good Men and Women."

by Kerry Long



Be a co-op now, and become a part of NASA's future in Space. Photo courtesy of NASA.

With the long awaited launch of the space shuttle this fall, the interest in NASA has never been higher among students. Those students who have dreamed of working for NASA someday, now may be faced with a limited number of opportunities to do so. In fact, Jim Harrington, head of NASA's co-op program at Goddard Space Flight Center, suggests that those who dream of working for NASA someday should consider co-oping with NASA now. According to Mr. Harrington, the number of entry level positions available at NASA are limited and these positions are most always offered to co-op students first. Thus, the prospects of getting a job at NASA without co-oping may be very difficult.

But future employment is not the only benefit of the co-op program. The program at NASA offers many immediate benefits that students can take advantage of now. One such benefit is of course the salary, which averages about 12,000 for a first year co-op student. This salary increases as the student acquires more credit hours at school. The second and more rewarding benefit is that of a $10,000 scholarship that NASA awards many of its co-op students in exchange to their services afterwards. This obligation of service is of course a small price to pay for someone who had future plans for working with NASA anyway.

Yet, NASA does not accept everyone who wishes to work for them. Mr. Harrington stresses that an employee of NASA must have a high GPA and an ability to communicate. He also believes that all majors are not equally regarded by NASA. When asked to explain this point, Mr. Harrington first started by exposing a misconception that I and many other people share.

It is easy to understand why NASA has very few openings for non-science majors such as business administration and finance. But what is difficult to grasp is the limited number of aerospace and aeronautical engineering positions available at NASA, an organization that specializes in these fields.

Instead of these majors, Harrington suggests a broader major, such as computer science or electrical engineering. Also helpful, especially for the new space station, are mechanical and material engineering majors. Those thinking of majoring either in astronomy or astrophysics are warned that a Phd. is usually required in these fields before NASA will consider them. Those hoping to enter NASA with a degree either in physics or applied physics are advised that their services may not be useful to NASA, while those applicants majoring in mathematics are encouraged to apply. Although, every type of major in every field of endeavor are needed by NASA to some degree, NASA of course favors majors that will be useful in their future tasks.

Those students who choose to co-op with NASA have an even greater chance than most to receive employment later on. Yet, whatever a student chooses to do, the job qualifications and acceptance at NASA will still rely on his GPA, his character, and his hard-working personality.

These things are what NASA is interested in most from their job applicants. These qualities will ultimately determine whether he will be one of the very few accepted into the space program.

National Aeronautics and Space Administration

Goddard Space Flight Center

Kerry Long is a freshmen studying Mechanical Engineering, and a first year member of NROTC. He hopes to co-op at NASA in the near future. We are happy to welcome him to our MECHELECIV staff!

A Co-op Experience at MITRE

by Rose Province

When Theresa Hallquist was asked what her advice would be to students considering the co-op program she said, "DO IT." Hallquist has found the advantages to the co-op program as opposed to straight engineering classes to be innumerable.

One major advantage was that her supervisor at MITRE allowed her to move around. Every co-op term, she was able to work in a different area of her field. This allowed her to pin point the areas that were interesting and challenging to her, and to find what she would want to stay away from in the future.

Hallquist worked in a division of MITRE involved in Air Traffic Control Technology Aviation Administration. During one co-op term her project involved the Human Interface for the air traffic control. This involved graphics design of a user interface for the controller, Hallquists's favorite project was what she worked on her recent co-op term. This assignment involved the Analysis of flight delays in the country. She received data about the hourly weather conditions at an airport. From this she was to determine the effect of the weather on flight operations using statistical techniques. In order to interpret the data, Hallquist had to do some research on Air Traffic Controllers Standards of Communication. Some of her research involved actual contact with Air Traffic Controllers. The analysis of the data was aided by SAS a statistical software package which she became familiar with.

Terry Hallquist is a senior in Operations Research. She has worked at Mitre Corporation for three years as a co-op. Actively participating in Tau Beta Pi and serving as an officer in Omega Rho has kept her busy throughout her undergraduate career. She is planning on continuing her education in graduate school.

Hallquist enthusiastically listed the advantages of her co-op career. Her work out on the field was an invaluable aid in her school work, as well as the other way around. She saw the theory she learned at school applied to real life. In addition to the knowledge she gained while working on her assigned projects, MITRE also offered her seminars that encompassed many fields. She also said that the opportunities of meeting people related to your own field of interest are excellent. In Hallquist's case, she met with people having skills and experience up to the PhD. level in her field.

Finally, Hallquist believes that the advantages offered by the co-op program far outweighs the inconvenience of prolonging college graduation for an addition semester or two. A resume that includes co-op work experience could mean the difference between getting the job you want and getting left behind!

FINDING THE PERFECT CAREER....

by Lilimar Avelino

Nancy Cohen graduated Summa Cum Laude in May 1988 from George Washington University School of Engineering and Applied Science with a Bachelors of Science in Electrical Engineering. She was the recipient of the GWU Cooperative Education Employee of the Year Award for 1987-1988. Her activities of affiliations at GWU included being a member of the Varsity Gymnastics Team for two years, Corresponding Secretary and Tutoring Coordinator for Tau Beta Pi, member of Eta Kappa Nu, Tau Beta Pi representative to the Engineer's council, member of the Institute of Electrical and Electronics Engineers(IEEE), and tutor for both Women's Athletics and Peer Tutoring.

FIRST CO-OP EXPERIENCE

Nancy Cohen started her COOP on-the-job experience during the summer of 1984 (May - August) at Fort Monmouth, N.J. in the Department of the Army Headquarters Net Radio Branch. Just coming out of her freshman year from GWU, she was in charge of putting together contracts, as well as researching different types of radio equipment and its costs. According to Nancy, it was just a lot of paper-pushing, not the practical engineering experience of hardware designing and software implementation that she desired.

JOB SEARCH

Due to the unsatisfactory paper-pushing tasks of her first coop experience at Fort Monmouth, N.J., Nancy underwent some massive interviewing in search of a new coop employer. As a result, she worked at Naval Research Lab (NRL), Plasma Physics Division, High Power Electromagnetic Radiation Branch from May '85 to January '86.

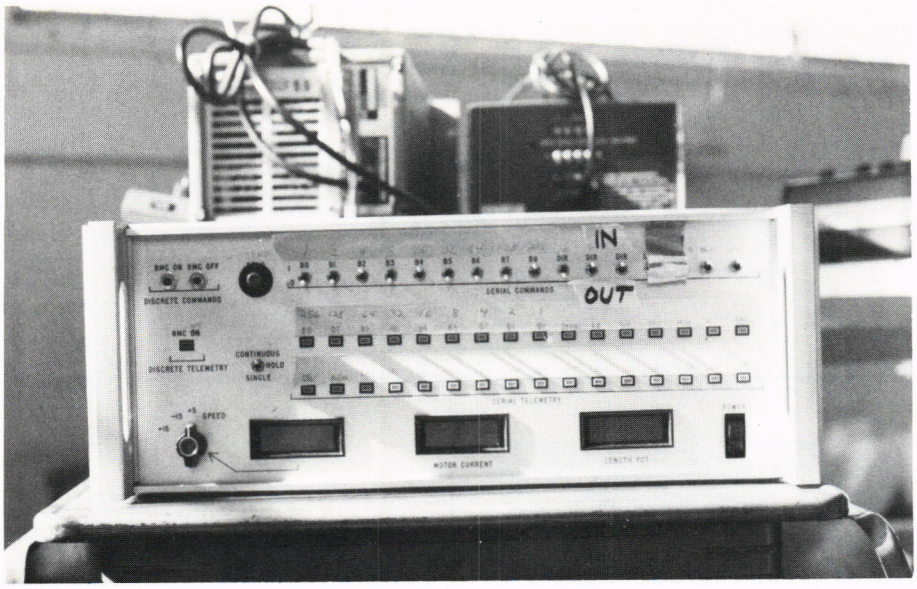
Here, she worked in a gyrotron (i.e., a high-powered magnetic device) laboratory. Among her duties, Nancy assisted in the maintenance of vacuum systems of a super-conducting magnet, designed and supervised the construction of a load box for a 10 GHz, 10 MW gyrotron, determined the requirements for a water cooling system of an electromagnet used for the gyrotron, and helped supervise the implementation of this system. However challenging or stimulating all this work sounds, Nancy's tasks involved much manual labor and learning, with little designing of hardware systems.

THE PERFECT JOB

After a job search within Naval Research Laboratory for a more hardware-oriented position, Nancy found her home at the Digital Flight Systems Section of the Space Systems Development Department, Spacecraft Engineering Branch. She was involved in engineering projects that were implemented as integral parts of the satellite and space shuttle programs.

From May '86 to August '86, she wrote and implemented software for an automated lifecycle testing system for a spacecraft motor. Using Hewlett-Packard testing equipment, she acquired data for the motor (such as speed, temperature, torque, etc.) and performed massive testing to make sure that the motor worked properly and would last.

At the end of her junior year from January '87 to August '87, Nancy was given more responsibility as a designer. She designed and assembled a spacecraft reaction control propellant valve controller and monitor. On a satellite, there are valves which control the flow of



Nancy designed, tested and integrated a spacecraft control and telemetry simulator involving digital, analog, LSI and discrete circuits for spacecraft subsystems testing.

fuel and propel the satellite in all different ways. Nancy built and tested a breakout box that opened valves and selected time duration for the valves to open and let the fuel flow.

SENIOR PROJECT

Nancy took advantage of her Coop experience by building a simulator, which was not only needed by her job, but satisfied the specifications for her senior project. She worked part-time during her senior year. Under the direct supervision of her bosses, namely George Flach and Robert Higgins, Nancy designed, tested and integrated a spacecraft control and telemetry simulator involving digital, analog, LSI and discrete circuits for spacecraft subsystems testing.

The main purpose of the project was to test a D.C. brushless motor and its controller. The controller and motor will be used to control the speed and direction of three booms (or arms) that will be employed on a satellite. A separate controller and motor is needed for each arm. The controller commutates the motor's voltages, since the motor does not have brushes to do it alone; however, the controller needs commands to know how to control the motor. The actual device that commands the controller, as well as most devices on the satellite is the Remote Command Unit (RCU). The device that collects telemetry is the Remote Telemetry Unit (RTU).

A major part of her senior design was the simulation of the RTU and RCU. The units were readily available for use by the controller designer; however, the booms were being designed and built in California, and the RTU and RCU were too bulky and expensive to be taken there. So, simulations were involved.

Since the satellite booms were in California, Nancy had to simulate the booms for the controller when testing at NRL. The controller knew how far the boom had moved by counting the number of clicks from the switches mounted on the boom. These switches were activated as the boom moved. In California, the controller would get a command from the simulated RCU to turn the motor on, and when it counted the number of clicks from the boom, it turned the motor off. With the boom simulator, the controller, motor and test system could be tested before being shipped out to California.

This project sent Nancy to California several times. First, she went to California to find and evaluate a company to build DC brushless motors. Then, she had to design, integrate and test all the components of the spacecraft control and telemetry simulator at NRL. Finally, she returned to California to see her masterpiece at work.

POST-GRADUATE PROJECTS

Nancy enjoyed her work at NRL, so she had no desire to go anywhere else after graduation. In addition, she still had an obligation to work for the government, since they paid for her tuition. Among her post-graduate responsibilities, she researched and evaluated CAD/CAM systems and co-wrote a procurements specification for a system which satisfied the need of the Spacecraft Engineering Branch. Recently, she was given her own project to test some satellite RF equipment, which involved budgeting, buying the necessary equipment, and designing.

MOST REWARDING CO-OP EXPERIENCE

Nancy's most rewarding coop experience was when they sent the control and telemetry simulator (as a result of her senior project) to California for operations testing, and it worked the very first time. Even now, it still works, so it seems to be passing the test of time. In addition, a couple of co-workers were able to design and build two of the same boxes from her design notes.

WHY CO-OP?

Coming to George Washington University from

Ocean Township High School in Ocean, N.J., Nancy Cohen did not even know what engineering was. Since she was good in math and science, her physics teacher from high school told her to become an engineer. Still unsure of her career goals, Nancy saw the COOP program as a means of gaining practical work experience. By integrating college-level academic study with on-the-job work experience, the COOP program "enhances a student's academic knowledge, personal development, and professional preparation." If a student finds this combination stimulating and challenging, he or she can be more confident about his or her career goals; however, if a student is unhappy or unsatisfied with the career choice in engineering, there is still time to change his or her undergraduate curriculum. So, the coop program was extremely advantageous for Nancy to pursue her career goals by gaining the practical work experience.

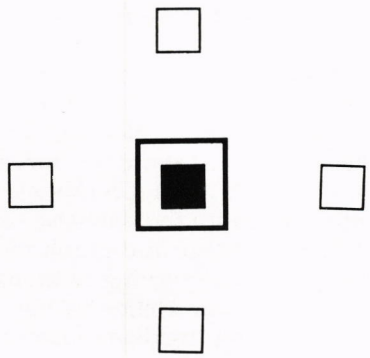
Another advantage of the COOP program is to give the student financial assistance or tuition aid. Nancy saw this as a means of attaining money for her education and at the same time acquire knowledge and skill both at school and on the job. Working under a government employer, namely Naval Research Laboratory, Nancy asked the government to pay for her tuition starting the second semester Junior year. This is under the condition that she "continue as a civilian employee of the government after graduation for a period equal to that during which the aid was awarded." Since Nancy enjoyed her job, she was delighted to return after graduation.

HOW DO YOU FEEL ABOUT THE GW CO-OP PROGRAM

One of the reasons that Nancy came to George Washington University is because GWU has a Cooperative Education Program. She knew what coop was at the time, so she asked admissions about it. However, Nancy feels that COOP is not publicized enough by the engineering admissions for incoming freshman, as well as by the GWU COOP coordinators for undergraduate students.

She also noticed that the COOP program has many connections to government agencies, but only a few connections to private companies. There are so many private engineering companies around the area who would be willing to train young, talented individuals for work after graduation. So, the GWU COOP program needs to make more contacts to local engineering firms.

Nancy suggested that the COOP program be more structured. Several COOPs from other colleges and universities get credit for their work experience, and they report on their duties and tasks for a particular work period. They are graded according to their reports. Nancy feels that getting credit and writing a report as a COOP should be implemented into the program for the future.



An Interview with Bobby Makheja

by Taraneh Amin

The cooperative education program has always been a valuable opportunity to combine practical work experience and classroom theory. Particularly in today's competitive and challenging world, you need whatever you can grab to get "an edge over other students who just have a degree," as Bobby Makheja, who worked in a Coop program last summer, states.

Bobby is a sophomore majoring in Electrical Engineering. In the interview, he sounded overwhelmed with his experience as an engineer. Bobby worked for Eurotherm International in the D.C. metropolitan area., which is a private firm with branches in England and Australia. He worked as a software engineer on a thermal control system project that turned out to be a success for the company. Bobby has found the job beyond his expectations, and he thinks that he will go back next summer, since he has been asked to come back by the company.

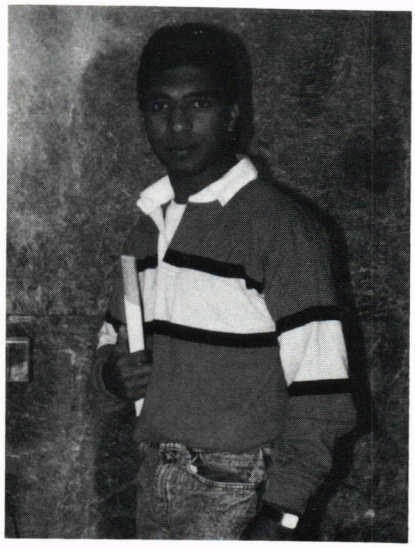
As Bobby says, he needed no experience to qualify for the job, but had to compete through interviews for the position. As a matter of fact, he believes that "computer classes, problem solving mentality and a willingness to learn" are all he needed in order to perform successfully on the job.

The languages used in the project were "C" and assembly language, both of which Bobby had not been introduced to until he got the job this summer. It has been with the patience and

assistance of his co-workers (Bobby stresses these two factors) and Bobby's hard work that he is now quite knowledgeable on these major and often used languages.

What Bobby liked most about his job was the fact that he was treated as an engineer in all aspects. He was given as much responsibility as other engineers, had to meet the deadlines, was criticized and complimented on different matters, and was invited to all the meetings outside the office, as well as inside the office.

Bobby admits that it has not been an easy summer for him, yet he appreciates it as a unique learning experience. He is more confident about his future and career than before. "Now I have better credentials for getting a more valuable job. Since there is going to be a lot of competition, using my coop experience as a tool will give me a stronger, fighting chance."



Bobby Kakheja is a sophomore majoring in Computer Engineering. He serves as the President of Theta Xi, and co-ops at Eurotherm International. His extracurricular activities include being an active member of the Engineer's Council, a math tutor, and a soccer player with the intercollegiate team. We are happy to welcome him to our staff!

CAMPUS NEWS

ETA KAPPA NU
The International Honor Society for Electrical and Computer Engineers

The George Washington University Theta Iota Chapter of Eta Kappa Nu (HKN), the electrical and computer engineering honor society, was established in 1979. The general purpose of the organization is to "bring those persons in the profession of electrical and computer engineering, who, by their attainments in college or in practice, have manifested a deep interest and marked ability in their chosen life work, into a close union whereby mutual benefit may be derived."

Among Eta Kappa Nu's activities is the survey of EE/CS instructors. The survey is performed at the end of each semester as a forum for students to express their opinions. Knowing these opinions, instructors can modify their teaching methods to educate students more effectively, and administrators can make efforts to retain the most effective instructors.

Much effort is expended to produce the results of the survey for each semester. Members of the chapter distribute the surveys personally to all EE/CS classes, enter them into the database, and compile, average and graph the results. Also deserving of thanks are Dr. Rachelle Heller for her advice during the development of the survey questions, Chairman James D. Foley for his advice and support in HKN's efforts, and the EE/CS secretarial and support staff.

The results of the survey are used as part of the basis for selecting the recipient of our "Teacher of the Year" awards. Last year, three deserving instructors from the EE/CS department received this prestigious award. Professor C. D. Martin received the "Teacher of the Year" Award for full-time professor. Professor Silverman accepted the "Teacher of the Year" Award for part-time professor. Mr. Irfan Khan received the "Teacher of the Year" Award for a graduate teaching assistant (GTA). HKN wants instructors to know that students care about their education, and express their appreciation to all teachers for spending time to prepare lectures and explaining concepts in a coherent and congenial manner in order to present students with a quality education. This year, in addition to the "Teacher of the Year" awards, a member of Eta Kappa Nu will be presented with the First Annual "Member of the Year" award.

Also in the spring semester, HKN presents the Abd Elfattah Abd Alla Prize to a student for superior academic achievement and outstanding services rendered to fellow engineering students. At the brunch prior to the Spring Honors Convocation, Professor Raymond Pickholtz, HKN's faculty advisor, and Rose Province, chairperson of the selection committee, presented Mr. Ka P. Lee this prestigious award for the second year in a row.

Congratulation go out to the HKN officers for the academic year 1988-1989. Miss Lilimar Z. Avelino was elected as president. Miss Rose Province was re-elected as vice-president for the third year. Miss Swati Patel and Miss Laura Gruber were selected for the offices of corresponding secretary and recording secretary, respectively. Mr. Steven Spak was elected as treasurer.

An EE/CS student or instructor interested in becoming an HKN member may contact

Eta Kappa Nu, via its mailbox at Tompkins Hall of Engineering.

— Lilimar Z. Avelino
President of the
Theta Iota Chapter
of Eta Kappa Nu

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THETA XI, THE ENGINEERING FRATERNITY

The Engineering Fraternity of the George Washington University is back. Theta Xi, a colony of Theta Tau, has regained its status and is in full force again.

During its past fifty plus years of activities, members of this fraternity have played a major role in supporting the SEAS community, the professional student engineering societies, and in the founding of the Engineer's Council.

However, in 1980, Theta Xi lost its recognition over the issue of admitting women into the fraternity. Due to greater student interest and the fact that Theta Tau, a professional fraternity, began admitting women as members, the Theta Xi chapter was revitalized.

Currently, it has a membership of twenty-three engineering students of which four are women. These members range from various classes and majors. Also, a large rush class of engineering students are joining this semester.

Its activities emphasize the professional development aspect of engineering, but also include social and service ideals. Theta Xi features a great blend of what the general fraternities, technical societies, and honor societies offer, to prepare its student members for the engineering society that awaits them.

-Bobby Makheja

TAU BETA PI

"The Tau Beta Pi Association was founded at Lehigh University in 1885 by Edward Higginson Williams, Jr. to mark in a fitting manner those who have conferred honor upon their Alma Mater by distinguished scholarship and exemplary character as students in engineering, or by their attainments as alumni in the field of engineering, and to foster a spirit of liberal culture in engineering colleges."
— The Preamble to the constitution of The Tau Beta Pi Association

The college experience transcends simple academics. The complete education transcends simply the technical arts. Those of us in Tau Beta Pi at GWU recognize this, and our activities and projects are undertaken with this in mind.

While the chapter's first purpose is to "mark in a fitting manner" engineering students of distinguished scholarship and exemplary character, we also recognize a responsibility for encouraging a spirit of liberal culture in this, and other engineering colleges.

Our chapter, designated as the District of Columbia Gamma Chapter, was installed on February 16, 1962 here at George Washington University. Just last year we celebrated our twenty-fifth anniversary with the dedication of "The Bent", our national symbol, in the lobby of Tompkins Hall of Engineering.

Every year we carry into execution a number of exciting projects. These projects range from the typical car wash to the climactic Engineers' Olympics held every spring.

This year our chapter will be actively engaged in fund raising as we work toward the establishment of a graduate fellowship designed to attract outstanding Tau Bates from around the country to our School of Engineering.

As in the past, the Tau Beta Pi Peer Tutoring program will be active this semester. Upperclassmen tutors have been secured for the majority of the freshmen and sophomore level technical requirements, and these tutors will be available on a regular, weekly basis for the entire semester. Most tutors involved in the program are Tau Beta Pi members, but due to manpower shortages and the availability of outside expertise, other outstanding students are enlisted for tutors as needed.

Each spring our chapter stages the Engineers' Olympics under the sponsorship of the Engineers' Council. This coming spring the Smith Center will host us for the 3rd Annual Engineers' Olympics. When teams(comprised of students from any single engineering department) face off on the basketball and volleyball courts, as well as the obstacle course. All to answer the immortal question of which department is innately superior to all others.

Other projects in the works are the revival of "The Connection" newsletter, under Engineer Council funding, and the institution of academic evaluations for the entire Engineering College. This would cover the non-EE classes that Eta Kappa Nu's teacher survey does not include.

The requirements for consideration for membership in Tau Beta Pi are strict. A senior must be enrolled in an engineering major, must be ranked in the top one-fifth of his class, and must have at least a 3.25 cumulative

grade point average. Junior must similarly be enrolled in an engineering major, must be ranked in the top one-eighth of his class, and must have at least a 3.30 cumulative GPA. In addition to this, candidates should have exemplary character — "integrity, breadth of interest both inside and outside engineering, adaptability, and unselfish activity."

-Matthew Moore
Tau Beta Pi President

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Computer "Virus" Epidemic Strikes Terror in GWU

One late Friday night, Jane Doe, a GWU student, desperately trying to finish her final project suddenly spotted something that gave her a chill. WHAM!!! A computer virus has struck... "Oh my God! It's gone! My final project...," she screamed in terror. Then, a message appeared on the screen that read in part: "Welcome to the dungeon... contact us for vaccination."

"Who are you? What do you want?" she replied. There, standing out amid a stream of random letters and numbers was the name and phone number of a Pakistan Computer Store run by two brothers - Amjad F. Alvi, age 26, and Basit Alvi, age 19.

Apparently, Jane Doe had been struck by a deadly program that hides in the computer's memory and awaits until Friday the 13th to spring to life unexpectedly. This particular virus known as the "brain" virus, named by its authors, had copied itself onto Jane's disk, scrambling its contents and turning her final project into bits of bogus information.

What Is a Computer Virus?

Computer "viruses" are actually miniature computer programs, intended to destroy information in computers. Computer viruses, concealed on floppy disks that contain programs necessary to run on the machine, such as WordPerfect, Wordstar, and Lotus 1-2-3, carries in its instruction code a recipe for making duplicates of itself onto the host computer. The virus may then order the computer to do a number of things:

- tells it to read the virus and follow its instructions,
- tells it to make a copy of the virus whenever an uninfected disk is inserted in the infected machine,
- tells it not to list the virus under the file system, and
- tells it to destroy all information on a certain date and time, via the computer's internal clock.

Viruses Invade the PC World

The "BRAIN" virus is just one of the many newly evolving methods of computer mayhem, here at GWU. Over the past year, the infection that struck Jane Doe (according to the September issue of Time magazine) hit more than 100 other disks at the Journal Bulletin, and as well as an estimated 100,000 IBM PC disks across the United States, including some 10,000 at George Washington University alone.

The "PEACE" virus spread a series of outbreaks that began last year, when a seemingly harmless Christmas greeting appeared mysteriously on terminals connected to the GWU IBM mainframe.

The "SCORES" virus named after a bogus computer file it created, recently entered several hundred MacIntosh computers at the National Aeronautics and Space Administration (NASA). This virus, which is still spreading, has reached computers in Congress Information Systems, the House of Representatives, Information Business Machines (IBM), and at least six other universities across the world.

Is Your Computer At Risk, and What Are Some Ways of Safeguarding Against Such an Attack?

Even in such a security-conscious computer world, computer viruses of one form or another are still spreading, and it may be only a heartbeat away from your computer. Once a computer has been hit by a virus, generally the simplest way to bring an infected computer back to health is to shut it down. Shutting down the computer purges its Random Access Memory (RAM) and all its current running processes. Then, turn the power back on of the infected operating system, and rebuild your files from scratch. NOTE: Control-Alt-Delete is no good.

Second, there are many numbers of software vaccine products or equivalents of a burglar alarm available on the market that attempt to protect your machine and your uninfected disks from an invasion by data snatcher intruders. Like a biological vaccine, though, none of these software vaccines are full-proof. However, what is clear is that only you can prevent a virus epidemic.

-Nadeem P. Malik

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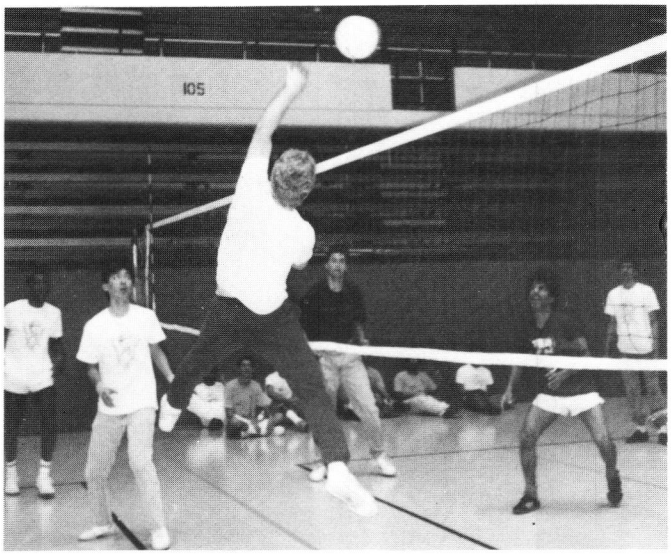
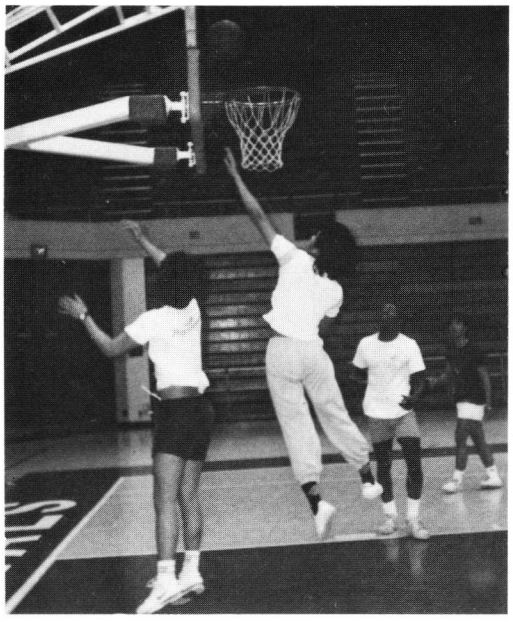
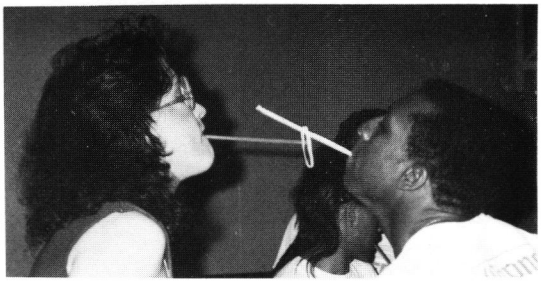
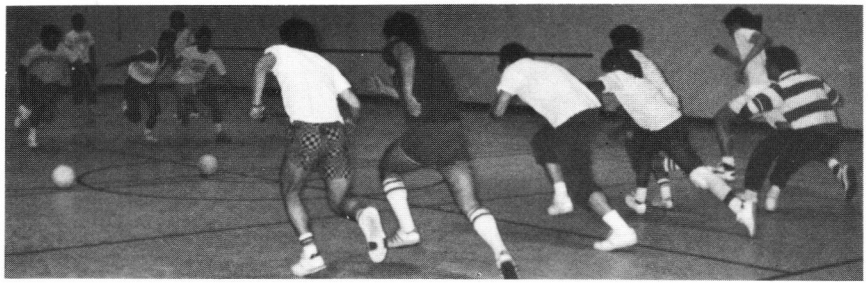
The Sports, Fun, and Laughter continue at the Annual Engineers' Olympics '88!!









April 2, 1988, was no ordinary Saturday, but one in which heard stopping rivalry was displayed amongst GWU's engineers. This event, held in the Smith Center from 10:00 to 7:00 pm, was quite different from last years. Not only was there a new way of scoring, but there was also a new way of choosing players.

The scoring was done by Gold-Silver-Bronze. The players were not entered as individuals this year, but as teams. Each department had several teams made up of students, faculty, and guests. Basically anyone could form a team as long as it consisted of six to eight people. Each team had their own name, yet they represented their engineering department.

The events played this year were the highly physical 3 on 3 basketball, the all-around popular volleyball, and the most challenging and mysterious obstacle course (which was played only for fun, not for the trophy).

During registration for the Olympics, the teams were allowed to choose which ever event they wished to participate in. A small participation fee was charged for teams to inter the competition, but this gave each member of each team a chance to enjoy a day filled with fun, competitive exercise, and a chance to wear another one of Eric Wolf's magnificently designed Tee-shirts!

Which ever team won the most Golds won overall. The "EE-Malays" expertly won a gold in Volleyball, while the "Team to Beat-Squared" (also representing the EE department) defended their gold in Basketball. Thus, this year's trophy once again remains with the EE/CS department.

The Obstacle Course was a hilarious event to watch, as fellow chall-mates and professors put their books aside to beat the clock against a treacherous track of silly, goofy, really back bending motions!

But no one was a loser in this year's Engineer's Olympics. Everyone once again enjoyed a fun filled, competitive, exhausting day, and each person walked out with not only a smile and aching bones, but also a one of a kind Tee-Shirt.

So as another spirited event gets marked down in SEAS's history, all are encouraged to participate in the excitement and rivalry this coming Spring.

—Swati Patel

Annual Engineering School Picnic—

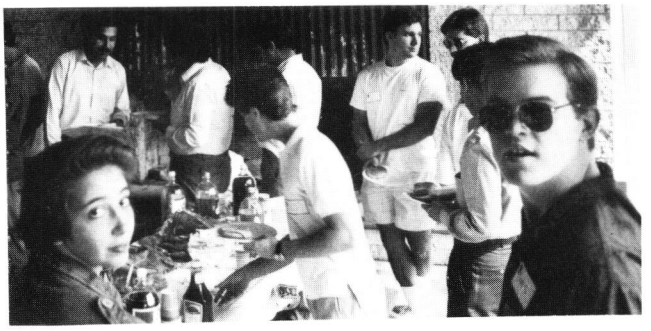
Where else could you enjoy barbeque chicken on the grill, play soccer with your friends, and challenge Dean Liebowitz to a game of horse shoes, except for at the Engineers' Picnic? The Engineers' Picnic this year was held on October 1, 1988, on a beautiful 75 degree day, at a park near Great Falls.

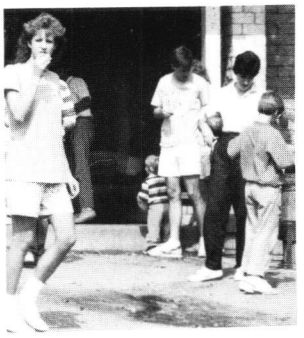
The picnic is co-sponsored by the Engineer's Council and The Engineer Alumni Association. Faculty, alumni, and students are all invited, giving us students a great opportunity to converse casually with faculty and alumni. Not only are they not boring to talk to, but they give great advice!

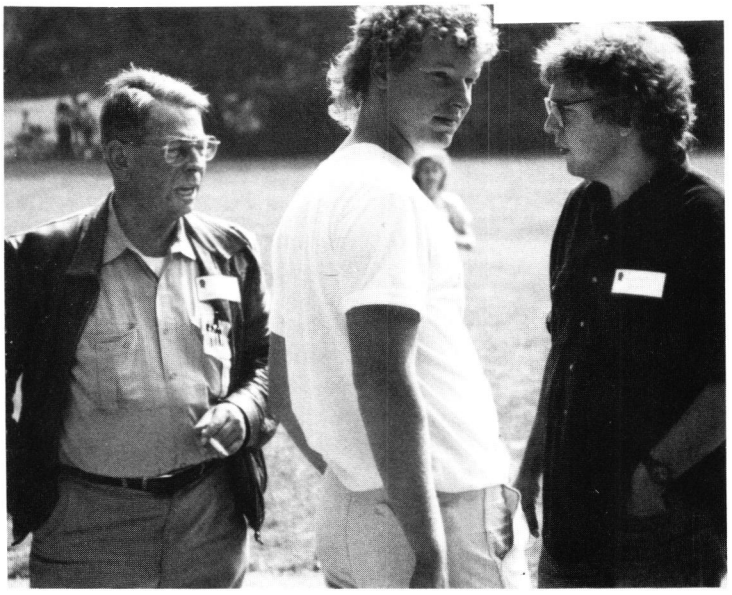
There was a feast of grilled hamburger, chicken and shis-ka-bobs, plus soda and chips, all at no cost to the participants. While some were stuffing their faces, others were playing soccer, volleyball and horseshoes (the Deans' favorite).

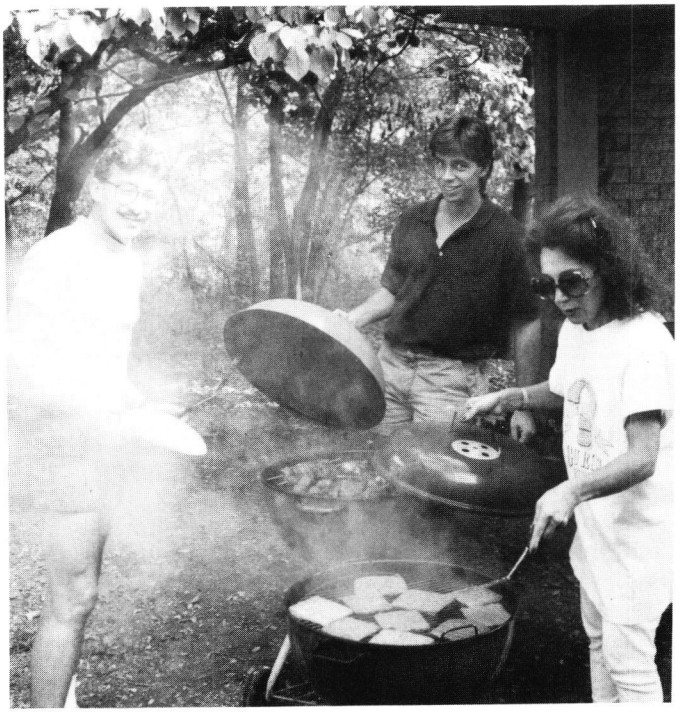
Don't miss it next year!!!

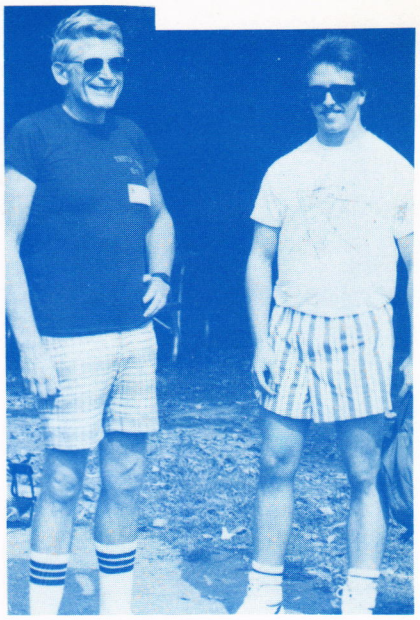
—Rose Province



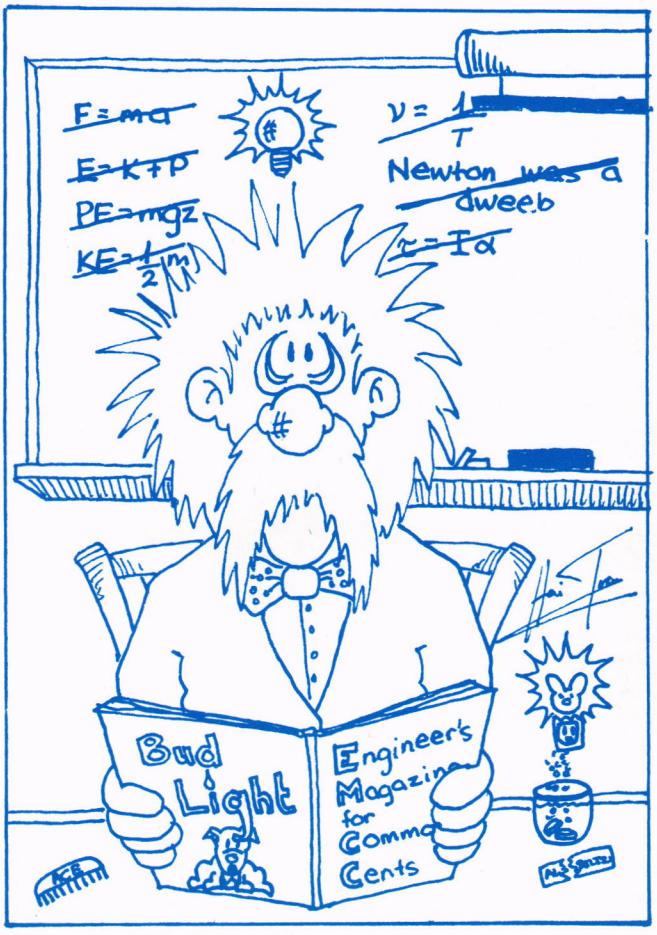








Annual Engineering School Picnic—



A GREAT MOMENT IN HISTORY

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